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## METER PRACTICES OF THE HACKENSACK WATER COMPANY<sup>1</sup>

BY D. W. FRENCH

*Meter testing.* When water meters are first purchased by the Hackensack Water Company, a record of test is required from the manufacturer of the  $\frac{1}{2}$ -,  $\frac{3}{4}$ -, 1- and 2-inch sizes as follows: a 10 cubic foot test on full flow, a 10 cubic foot test on a  $\frac{1}{2}$ -inch stream, and a 0.1 cubic foot test on a  $\frac{1}{8}$ -inch stream. The complete test for a 3-inch meter is a 10 cubic foot test on full flow, a 10 cubic foot test on  $\frac{1}{4}$ -inch stream, a 10 cubic foot test on  $\frac{1}{8}$ -inch stream, and a 0.1 cubic test on  $\frac{1}{16}$ -inch stream. The complete test for a 4-inch meter is a 100 cubic foot test on full flow, a 100 cubic foot test on 1-inch stream, a 10 cubic foot test on  $\frac{1}{4}$ -inch stream, and a 10 cubic foot test on  $\frac{1}{8}$ -inch stream. For a 6-inch meter the tests are a 100 cubic foot test on full flow, a 100 cubic foot test on 1-inch stream, a 10 cubic foot test on  $\frac{1}{4}$ -inch stream, and a 10 cubic foot test on  $\frac{5}{8}$ -inch stream. For an 8-inch meter the tests are a 100 cubic foot test on full flow, a 100 cubic foot test on 4-inch stream, a 100 cubic foot test on 2-inch stream, a 100 cubic foot test on 1-inch stream, and a 100 cubic foot test on  $\frac{1}{2}$ -inch stream.

The records of all tests include the change gears used with each and every meter. Before the  $\frac{1}{2}$ -,  $\frac{3}{4}$ - or 1-inch go into service, a separate test is made by the water company, and no meters of these sizes are installed which do not show an inaccuracy of from 1 to 2 per cent against the water company.

The  $\frac{1}{2}$ -,  $\frac{3}{4}$ - and 1-inch meters are also subjected to a water pressure test of 350 pounds per square inch by means of a hand pump.

In making tests often required by customers because of high bills, such meters are considered accurate if tests show them to be within 2 per cent either way.

The author feels that he cannot emphasize too strongly the importance of testing carefully all meters which have been frozen. His experience has been in scores of cases that the disc chambers or,

<sup>1</sup> Read before the New York Section, December 20, 1918.

in the rotary piston type of meters, the top head or bottom plate, or possibly both parts, were so badly sprung that merely replacing the bottom casting does not restore accurate registration. It is agreed that because a meter freezes this does not belittle it in any way, although it may cost more to repair some makes than others. Yet there is no good reason why meters cannot be protected from frost and freezing is almost invariably due to lack of consideration or negligence, in either of which cases, the expense of repairs should be borne by the owner of the premises.

*Meter setting.* All meters used in connection with the Hackensack system are owned and kept in repair by the company, except in cases of misuse or freezing, when a deposit is required to cover the cost of repairs. After this cost is known, the balance is returned to the owner of the premises.

Prior to January 1, 1918, applications for service were made by about 200 plumbers licensed by the water company. After the service main was installed and the building was ready for occupancy, the meter was delivered to the plumber and set by him. Since January 1, 1918, the water company has been setting all meters and the plumbers no longer have anything to do with this part of the work. When the meter is set, a shut-off cock is placed on each side of it and a check valve is also located on the house side of the meter, which acts as a protection to the meter as well as a protection to the property of the owner, should a break occur in the street main.

Only a small percentage of the meters is set in outside meter boxes, and such settings are confined almost entirely to manufacturing plants and private fire lines. Suitable concrete boxes are required for such outside settings, and built at the expense of the applicant.

In manufacturing plants, where the use of water is large and often lasts for the full twenty-four hours, the company has found it advantageous, both to the consumer and itself, to install the meters in batteries, which, of course, adds to the expense, but enables examinations, repairs or changes to be made without interruption to the service.

*Meter reading.* All meters on the system, of which there are about 45,000 in use, are read and billed quarterly, except about 300 in sizes between  $1\frac{1}{2}$  and 10 inches, which are read and billed monthly. Meters registering more than 25,000 cubic feet per month are in-

cluded in the monthly survey. All meters in the monthly survey are read on the last day of the month, provided it does not fall on a Sunday or a holiday, in which event readings are made on the following day.

In reading the quarterly meters, the districts are divided into block and working numbers. Each inspector's territory covers about 3500 meters, and he reads, on an average, about 175 meters per day. The quarterly readings begin on the first day of the last month in the quarter, and must be completed not later than the 20th.

Each man starts out with about 200 cards on which readings are entered, and each card, by using both sides, provides for such quarterly readings for a period of four years. These cards are turned in again in the afternoon, together with any and all complaints, such as meters not working, broken glasses, meters leaking, etc., all of which receive attention on the following day. Printed cards are also mailed on the day following the reading to all customers where the meter shows an increased or unusual consumption. The reading cards are then used in making out the quarterly bills.

By repeating this operation each day during the reading period, it is plain that on the day following the last reading day, all defective-reading meters have been changed, that the many and various small complaints have been attended to, that bills have all been made out, and there has been ample time for comparisons, checking, etc., before the end of the month. During recent years the company has not failed in getting into the mail during the last day of the quarter, the entire survey bills, which are then in the hands of its customers on the first day of the following quarter.

*Collecting, etc.* Promptly after the bills reach the customers, payments begin to come in, and an accurate record and report of collections is made by each district office and tabulated at the main office, showing each morning the sum of money collected in each district and its percentage relation to the survey.

In following any such plan, an excellent opportunity is afforded for comparing the work of the various collectors.

During recent years the records show that about 65 per cent of the total surveys are collected during the first thirty days, and from 26 to 30 per cent during the second thirty day period.

*Maintenance.* For many years the Hackensack Water Company have been following the practice, initiated in the early nineties, of

removing for test and a general going over, the various sizes of meters after having registered a fixed quantity of water and regardless of the length of time required to reach these quantities. The practical result is that every meter installed on the system comes into the shop at about uniform intervals for a general overhauling. After examination, repair, test and painting, the meter is returned to stock and is ready for another period of use. Following this practice, a very small percentage of meters breaks down, and the author is sure that a higher degree of efficiency is maintained between the intervals of fixed registration.

For more than twenty years the company kept up its original plan of making these changes, as follows: Change all  $\frac{1}{2}$ -inch meters after registering 100,000 cubic feet; change all  $\frac{3}{4}$ -inch meters after registering 250,000 cubic feet; change all 1-inch meters after registering 500,000 cubic feet; change all 2-inch meters after registering 2,000,000 cubic feet. In sizes above  $\frac{1}{2}$ -inch records were kept of all examinations, including examinations of intermediates, and changes were made when it was deemed necessary.

All such changes are now made under the rules, regulations and recommendations of the Board of Public Utility Commissioners for the State of New Jersey, which are as follows: Change  $\frac{1}{2}$ -inch meters each 10 years, or after registering 750,000 cubic feet; change  $\frac{3}{4}$ -inch meters each 8 years, or after registering 1,000,000 cubic feet; change 1 inch meters each 6 years, or after registering 2,000,000 cubic feet; change all meters larger than 1 inch each four years.

All work in connection with the testing, repair or maintenance of the meters is performed in the water company's shop, which is complete with up-to-date tools and modern testing equipment, and seven or eight men are steadily engaged on this work.

After all is said and done, the real measure of the success of the efforts is the percentage of water actually delivered into the transmission mains that can be accounted for. During recent years the company has been converting into revenue from 71 to 74 per cent of all water pumped at its main pumping station, making no allowance for pump slip, no allowance for loss on mains, no allowance for reservoir seepage, no allowance for water used at fires or flushing of sewers, no allowance for losses due to broken transmission or distributing mains, or losses from service mains leaking between the street main and meter, and no allowance for meter inaccuracies. Such results as have been obtained are due in a large measure to the uniformly careful attention given to the water meters.

*DISCUSSION*

W. W. BRUSH: In New York City, the property owner now determines the size of the meter, and generally selects one of the same size as the service pipe. The Department of Water Supply contemplates a greater control of the size of the meter, and where one is found to be so large that it does not register the various flows correctly, a smaller meter will be called for, even if it is smaller than the service pipe. The topics touched on in the paper suggest the desirability of more information on the use of check and safety valves and the possibility of pressure being put on the house plumbing when steam forms in kitchen boilers, and on the setting and repair of meters.

D. W. FRENCH: In our system about 87 per cent of the services are metered. The smallest service is  $\frac{3}{4}$ -inch and a  $\frac{1}{2}$ -inch meter is used on it. Generally the meter is of the same size as the service, but in some cases it is smaller, for there are service pipes that are found to be needlessly large.

No case has been reported where house plumbing or range boilers were injured because check valves were placed on services and pressure due to steam in the boilers could not be relieved by a back flow through the service pipe. On the other hand there have been many cases where range boilers were protected, by the presence of check valves, from injury when a street main broke. The closing of the check valve prevented the draining of the plumbing systems and the collapse of the boiler. The check valve is preferably placed on the house side of the meter, as it protects the meter from injury by hot water. A safety valve is not of much value, but its cost is so small that the company recommends it as worth its expense, although it is not insisted upon.

The meters are set inside the cellar wall. No particular location is required, other than they shall be 16 to 18 inches above the floor, not exposed to frost, and accessible for reading and changing. When the meter is removed in accordance with the regulations stated in the paper, it is tested to ascertain its inaccuracy. It is then taken apart, thoroughly overhauled, parts badly worn are replaced, and it is reassembled, tested, painted and returned to stock. The quarterly changes from all causes vary from 1.5 to 2 per cent. The meters that are removed in accordance with regula-

tions sometimes show an inaccuracy of only 2 or 3 per cent after being in service a number of years, and sometimes the inaccuracy is 8 or 10 per cent. The cases of large inaccuracy generally occur in meters near dead ends where the mains are liable to contain more sediment than elsewhere.